REMARKS

This amendment is in response to the Examiner's Office Action dated 7/3/2003. Reconsideration of this application is respectfully requested in view of the foregoing amendment and the remarks that follow.

STATUS OF CLAIMS

Claims 1-46 are pending.

Claims 1-46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shanmugasundaram et al., "Relational Databases for Querying XML Documents: Limitations and Opportunities".

OVERVIEW OF CLAIMED INVENTION

The presently claimed invention provides a method of translating queries of XML data into queries against a relational database. In addition, a method is provided for publishing the queried relational data as an XML document thus precluding the necessity for an intermediate data representation.

Translation occurs when an XML query is parsed and transformed into an intermediate language-neutral query representation. The intermediate language-neutral query representation is then transformed into an SQL query that is issued over a relational table in the database where the relational table corresponds to a virtual XML document.

A tagger graph is generated from the intermediate language-neutral representation of the XML query. Each of the nodes of the tagger graph is an operator that performs processing on the results of the SQL query results. Traversing the tagger graph generates tags and structure for

XML output. When SQL query results from the relational database are provided as input to the tagger graph and a traversal of the graph generates the tags and the structure by processing these inputs, a structured XML document is produced.

Based on the structure of the initial XML query, a tagger graph is generated during run-time to put currently flattened relational tuples back in a hierarchical graphical XML structure.

In the Claims

REJECTIONS UNDER 35 U.S.C. § 103(a)

The Shanmugasundaram et al reference (hereafter Shanmugasundaram) is co-authored by one of the inventors of the present invention and provides for a system and algorithm that converts XML documents to relational tuples, translates semi-structured queries over XML documents to SQL queries over tables, and converts the results to XML. Shanmugasundaram also proposes a method of processing a Document Type Descriptor (DTD) to generate a relational schema. The schema and element graph are then used to determine how XML data will be stored in a relational database. The primary basis for this reference is its provision for the storage of XML data - no major mention of querying and query result processing is made.

With regards to claims 1, 22, and 44, the examiner has included the Shanmugasundaram reference specifically for its discussion of accessing, processing, and publishing XML data stored in relational databases (starting at page 2, col. 1 lines 21-30). The examiner has pointed to page 3, col. 1, lines 1-10 as constituting a tagger tree graph having each node comprising a tagger operator with a parse tree associated, therewith. However, a closer reading of these sections reveal only a general overview of XML, which is well known in the art. The referenced section therefore fails to provide the claimed tagger tree graph, tagger tree operator, and parse tree associated.

While the disclosed system (Shanmugasundaram) provides for a method to process a DTD to generate a relational schema, cited by the examiner on page 2, col. 1, lines1-10 and in figs. 8 and 9, the present invention provides for querying XML views of relational data without relying upon DTDs or XML schemas. This is clearly different from the method of the present invention, generating a tagger tree graph from an XML query.

The present invention discloses a default XML view upon which more complex views are derived – the tagger graph corresponding to a particular XML view is derived from the XML query directly, rather than from a general DTD to which a specific document may conform.

In addition, the tagger graph disclosed by the present invention is also created at run-time as opposed to the relational and element graphs disclosed by Shanmugasundaram.

In addition, the disclosed system (Shanmugasundaram) makes no mention of using a tagger graph to tag and structure the results of an SQL query to a relational database, and thus fails to provide a method for evaluating parse trees associated with each tagger operator to tag of said XML language over said relational database in the manner of the present invention.

With regards to claims 2 and 23, Shangmugasundaram provides for an element graph to create relations. Shangmugasundaram does not teach nor suggest a system for tagging or structuring the results of an SQL query of XML data stored in a relational database. In fact, Shanmugasundaram teaches away from the present invention. Specifically, the disclosed algorithm (Shanmugasundaram) provides for a method of flattening XML data into a relational tuple, whereas the present invention provides for a method of publishing an XML document from a relational tuple. The present invention also provides for a method of tagging results of an XML query without necessitating the use of inlining.

The disclosed algorithm (Shanmugasundaram) provides for the creation of a relation for the root element of the graph, and for inlining the element's descendents into that relation.

The examiner has recited the exact language of the remaining claims (3-21, 24-43, 45, and 46) and has suggested a correlation with the Shanmugasundaram reference. However, the examiner has not established the required *prima facia* case of obviousness. Specifically, the examiner has not set forth any elements in Shanmugasundaram that provide for the claimed

features. It is our position that Shanmugasundaram does not describe or suggest these claimed features.

The claims of the present invention include at least the following elements not provided for, nor suggested, by Shanmugasundaram:

- tagger operators comprising any of a tagger input operator, a tagger scalar operator or a tagger aggregate operator
- tagger graph includes a tagger input operator for each level in a result XML tree of said XML query
- said tagger input operators execute in a sorted outer union mode
- tagger input operators comprise a shared tagger row stream
- tagger input operators execute in a node strip mode
- tagger operators comprises a tagger row stream
- each tagger operator performs any of a cr8_elem, a cr8_attr, a cr8_attr_list, a cr8_fragments or a cr8_fragment_list function
- each tagger operator implements a next method to produce a result row
- transforming said XML queries into a language-neutral intermediate representation;
- rewriting said language-neutral intermediate representation into an equivalent form easily translated into an SQL query;
- tagger graph is generated from said equivalent form.
- tagger graph includes a tagger input operator for each node in a result XML tree of said XML query.

- tagger input operators execute in a sorted outer union mode and said translating step produces a single SQL query to produce a single sorted outer union relational database result.
- A method of tagging results of an XML query over a relational database, as per claim 11, wherein a number of relational database tables of said relational database are mapped to a number of virtual XML documents and said XML queries are issued over said virtual XML documents.

SUMMARY

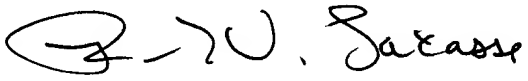
As has been detailed above, none of the references, cited or applied, provide for the specific claimed details of applicants' presently claimed invention, nor renders them obvious. It is believed that this case is in condition for allowance and reconsideration thereof and early issuance is respectfully requested.

We respectfully request the Examiner to acknowledge receipt of the formal drawings which were filed on June 18, 2001.

As this amendment has been timely filed within the set period of response, no petition for extension of time or associated fee is required. However, the Commissioner is hereby authorized to charge any deficiencies in the fees provided to Deposit Account No. 09-0441.

If it is felt that an interview would expedite prosecution of this application, please do not hesitate to contact applicants' representative at the below number.

Respectfully submitted,



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